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Geographies of Violence in Jerusalem: The Spatial Logic of Urban Intergroup Conflict

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ABSTRACT

This paper assesses how spatial configurations shape and transform individual and collective forms of urban violence, suggesting that geographies of urban violence should be understood as an issue of mobility. We document and map violent events in Jerusalem, assessing the possible impact of street patterns: segmenting populations, linking populations, and creating spaces for conflict between the city's Jewish and Palestinian populations. Using space syntax network analysis, we demonstrate that, in the case of Jerusalem, street connectivity is positively associated with individual violence yet negatively associated with collective violence. Our findings suggest that understanding the logic of urban intergroup violence requires us to pay close attention to local urban morphology and its impact on intergroup relations in ethnically divided and heterogeneous environments.

Key words: Political Violence, Spatial Violence, Intergroup Conflict, Contested Cities, Space Syntax, Jerusalem, Palestinian–Israeli Conflict

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1. INTRODUCTION

Are certain urban locations more prone to intergroup violence than others? How do mobility, proximity, and connectivity shape the opportunities available to individuals and groups to engage in violent conflict? Following recent calls for scholarship dedicated to understanding violence from a geographical perspective (Gregory & Pred, 2007; Springer & Le Billon, 2016), this paper combines insights from political geography, urban studies, criminology, and political science in order to address the questions outlined above. We use computational space syntax and grid-based analysis to map recent urban intergroup violence in the ethnically contested city of Jerusalem. Our analysis of street networks in Jerusalem highlights the major, yet differential, role which geography plays in the emergence of individual and collective violence. These findings, we argue, offer relevant lessons for a broader understanding of urban violence and its spatial variations.

Over the last few decades, a growing body of literature has discussed cities labeled as ethnically “polarized,” “contested,” and “divided” (Bollens, 1998; Hepburn, 2004; Kliot & Mansfeld, 1999). Contested cities, such as Beirut, Nicosia, Belfast, and Jerusalem, frequently exhibit distinctive local attributes together with complex political dynamics and tensions (e.g., Bollens, 2000; Calame & Charlesworth, 2009; Gaffikin & Morrissey, 2011), leading to the emergence of diverse forms of violence (Savitch, 2005). As a “notable contested city,” and a major focal point in the Israeli–Palestinian conflict, Jerusalem and many of its residents are afflicted by various forms of intergroup violence, often politically motivated. Palestinian¹ residents suffer from long-term state-led police violence and oppression in most spheres of life, including planning, housing, and education (Shlomo 2017; Shtern 2018). Jewish residents, by contrast, endure varying degrees of violent attacks, typically

perpetrated by Palestinians. Although Palestinian violence in the city has decreased since the end of the second Palestinian civilian uprising (hereinafter, intifada) in 2005, violence continues to rage periodically, manifesting mainly in riots (violence that bears a collective essence), as well as stabbings and ramming incidents (which are more sporadic and individualistic in their patterns).

In an effort to uncover a logic of violence, previous work on urban violence and conflict has, at times, focused on the characteristics of perpetrators (Gill, Horgan, & Deckert, 2014; Humphreys & Weinstein, 2008; Moskalenko & McCauley, 2011; Pantucci, 2011). However, a close examination of the perpetrators of violence in Jerusalem during recent years reveals that they share very few common characteristics. Indeed, young and old, male and female, employed and unemployed, religious and secular residents of Jerusalem alike have all engaged in intergroup violence. Given such disparity, in this paper we put aside questions regarding individual level characteristics and instead turn our attention to unpacking the spatial logic of urban intergroup violence.

In emphasizing spatial patterns of violence, we advance a nuanced perspective of urban intergroup relations, asking whether all locations are equally prone to individual and collective violence. Alternatively, are there unique spatial attributes which attract individuals, but not groups, who are interested in perpetrating violence? Our theoretical framework and empirical analysis suggest that connective urban spaces provide actors with mobility and are thus prone to individualistic violence. Concurrently, collective violence, which is far less dependent on mobility, spreads across less accessible urban space and is negatively associated with street connectivity.

To the best of our knowledge, this is the first study to map and analyze the diverging spatial patterns of individual and collective urban intergroup violence. Thus, hereinafter, we introduce a granular geolocated dataset of violent events which occurred in Jerusalem between 2014 and 2016 and, further, analyze individual and collective interethnic confrontations using space syntax and grid analysis methods. In addition to the theoretical and methodological innovation of our approach, this is the first study to examine systematically patterns of violence in the most recent cycle of confrontations in Jerusalem, referred to by locals as the Knives' Intifada, al-Quds Intifada, or the Children's Intifada.

The following section outlines our theoretical framework. Thereafter, the third section situates our case study, Jerusalem, in the context of the broader theoretical framework, relating it to the contested cities literature. In the fourth section, we introduce a new geolocated dataset of violent events which occurred in Jerusalem during the years 2014 through 2016. In the fifth section, we describe our space syntax and grid-based methodological strategies. This is followed by section six, in which we demonstrate the role of connectivity by implementing a spatial analysis of individual and collective violence. Finally, we conclude with a discussion of our findings and their implications for future research regarding the geographies of individual and collective urban intergroup violence.

2. THEORETICAL FRAMEWORK

A growing body of literature examining the impact of geographical and spatial factors on the emergence and patterns of violence depicts how general spatial attributes— including terrain type, accessibility, territorial control, or road networks— affect the onset, recurrence, and dynamics of organized collective violence (e.g.

Bhavnani, Donnay, Miodownik, Mor, & Helbing, 2014; Bhavnani, Miodownik, & Choi, 2011; Fearon & Laitin, 2003; Fjelde & Østby, 2014; Linke, Schutte, & Buhaug, 2015; Tollefsen & Buhaug, 2015; Weidmann, 2009; Zhukov, 2012). Many of these advances apply an explicitly spatial approach to conflict, mainly using geographical information systems (GIS) to examine how the distribution of inequalities and capacities across space affects patterns of violence. More recent studies have adopted a narrower geographical scope, considering the effect of urban residential patterns and spatial configurations on interethnic violence in Jerusalem (Bhavnani et al., 2014) and Baghdad (Braithwaite & Johnson, 2015; Weidmann & Salehyan, 2013).

While interest in the spatial dimensions of conflict is a rather recent development amongst political scientists, geographers have for some time discussed the role that spatial attributes play in the dynamics of violence in urban contexts (Graham 2004, 2010; Fregonese 2017). Coward (2006), for example, notes that in the Bosnian civil war, well-networked public spaces were more frequently attacked by militias because their proximity to main transportation and communal activities facilitated intergroup civilian contact.

While such studies shed light on the relations between contested² urban space, violence, and connectivity, it is important to focus specifically on urban dynamics, exploring how intra-city variation in connectivity affects violence and conflicts more broadly (Rokem et al., 2017). Indeed, violence is a complex social phenomenon, and patterns of violence are often multifaceted (Gutiérrez-Sanín and Wood 2017). Therefore, we develop herein a theoretical framework that concentrates on individual and collective violence, as well as the ways in which spatial configurations influence their distinctive perpetration.

Individual assaults vary in terms of scope, lethality, and strategy. Therefore, we propose a general definition according to which individually perpetrated violence includes any kind of armed individual act of aggression intended to inflict physical harm on countergroup members. We consider collective violence to be any group behavior aimed at causing harm to countergroup members.

Acting alone to perpetrate ethnic violence is often a difficult task. Thus, in order to overcome challenges and maximize utility, individuals must exploit the unique spatial attributes of their surroundings (Becker, 2014). In the next section, we discuss several of these dimensions, including accessibility and mobility, local opportunity structures, and strategic values of urban spaces.

2.1 Mobility

Previous spatial analyses of violence and crime reveal that perpetrators are constrained and influenced by mobility (Capone & Nichols, 1976; Eck & Weisburd, 1995; Zhukov, 2012; Summers & Johnson, 2017). Furthermore, evidence indicates that individuals tend to act relatively close to home. Indeed, some scholars claim that the distance traveled to perpetrate violent crime is a function of the individual's opportunities and returns. While many offenders and criminals are reluctant to commit armed robbery or assault in their immediate neighborhood, for reasons of exposure and anonymity, traveling far away is often not cost effective. Following this logic, we can assume that incidents occurring farther away from a criminal's locality often involve high stakes, in addition requiring arms and weapons (Capone & Nichols, 1976; Eck & Weisburd, 1995).

Applying this logic to intergroup confrontations in ethnically contested cities, it is reasonable to expect that individual perpetrators will be inclined to commit

violence in centrally connective locations because such sites are relatively accessible by road networks. Moreover, unlike segregated neighborhoods, connective spaces provide relative anonymity while simultaneously hosting abundant potential targets. Thus, perpetrators are attracted to connective locations in ethnically divided cities because these balance between the need to distance themselves from their community on the one hand and the necessity for lengthy travel on the other.

However, the choice of location is also influenced by awareness to potential targets. Thus, evidence shows that the selection of a location for crime and violence often occurs prior to the day of action: perpetrators pick and choose suitable spaces as part of their ongoing routines. This helps to explain the clustering of violent crime in commonly visited and familiar locations such as transportation vessels, subway stations, markets, and other highly connective and populated spaces (Brantingham & Brantingham, 1995; Eck & Weisburd, 1995). It has also been shown that individuals committing lethal assaults frequently confine their action to familiar locations (Becker, 2014). Considering the centrality of and public familiarity with connective spaces such as subway stations or central public locales, as opposed to non-connective spaces such as peripheral residential areas, individuals are at greater risk of being targeted in connective spaces.

2.2 Spatial Opportunity Structures

Clearly, connective locations provide a multitude of opportunities for offenders seeking to implement individualistic intergroup violence. Indeed, the “routine level approach” to the spatial analysis of crime acknowledges the need for an opportunity structure, positing that crime occurs in locations which lack sufficient supervision and

wherein motivated offenders and suitable targets are commonly situated (Cohen & Felson, 1979). According to this approach, central urban spaces which host city residents on a day-to-day basis constitute optimal environments for the perpetration of a crime.

Offenders may well be inclined to implement attacks in connective locations, such as transportation hubs and markets, because these are frequented by individuals who are relatively distant from their home neighborhood and peripheral residential areas. In other words, offenders choose connective spaces because they promise easy and profitable implementation of crime and violence (Brantingham & Brantingham, 1995, Coward, 2006). Thus, rather than approaching a countergroup's neighborhood within an ethnically divided city or searching for a suitable target within their own neighborhood, perpetrators interested in implementing individualistic intergroup violence can find abundant accessible targets in connective and central locations.

2.3 Strategic Locations and Expressive Violence

Unlike crime, ethnic violence is often motivated, at least partially, by broad political and ideological agendas. As such, locations (and targets) are frequently selected to maximize not only potential casualties but also broader political goals of deterrence, disruption, intimidation, or dissent. Likewise, violence is often employed to reveal vulnerability and retaliate against countergroup repression. Moreover, urban intergroup violence and acts of terror are commonly designed to interrupt the daily fabric of life (Beall, 2006; Savitch, 2005).

For the reasons noted above, populated connective locations may seem rather attractive to individual perpetrators of intergroup violence. Violent attacks

within the heart of a city—an area that is often overpopulated and crucial for performing mundane urban functions—promises extensive casualties, disruption of routines, and intimidation of countergroup members. The decision to perpetrate violence in connective locations guarantees not only substantial casualties but also the effective dissemination of ideas and messages. This is not to say that strategy and deterrence are the main motivators for individually implemented intergroup violence; however, central locations provide an added value. Indeed, committing violence in such areas may send signals to countergroup members and additional perpetrators, affecting the equilibrium of urban intergroup relations and public life in the city more generally.

2.4 Diverging Spatial Logics

Considering the mobility, opportunity structure, and strategic value of connective spaces, it is reasonable to expect that numerous individualistic attacks will occur within central and connective areas of ethnically divided cities. In a sense, connective locations enable *relatively* discriminatory violence: perpetrators interested in harming countergroup members can approach a bus terminal or a market; identify specific suitable targets; inflict harm upon them—signaling a broader message to a countergroup—and in some cases escape.³

By contrast, urban collective violence entails different challenges to those involved in individual violent action. Thus, the unique attributes of connective space may be irrelevant for group action. For example, while mobility can concentrate many individuals in a central location, the segregated nature of contested cities and their neighborhoods provides suitable opportunity structures for collective action, undermining the need for mobility. In other words, rather than travelling to connective

and contested urban spaces and reconvening within them, groups seeking to perpetrate collective violence may find it more cost effective to exploit their homogenous surroundings and express aggravated dissent within them. Therefore, we expect to find collective violence scattered across the urban space, far from connective locations.

Considering the theoretical framework described above, and the roles played by mobility, spatial opportunity structures, and strategic locations, as aforementioned, we propose a set of hypotheses that indicate the diverging spatial logics of individual and collective violence:

H1: Connective locations will experience *higher* rates of individual violence.

H2: Connective locations will experience *lower* rates of collective violence.

We assess these propositions using the case of Jerusalem. However, before reviewing the empirical analysis, it is important to situate our case study.

3. WHY JERUSALEM?

Jerusalem is a widely contested urban environment which endures persistent cycles of intergroup violence. Inequality in Jerusalem is often attributed to group-based differential growth patterns and the in-migration which occurred over the past century. More broadly, Jerusalem is situated in the vortex of the Palestinian–Israeli conflict, and the separation of ethnic groups within its residential areas is a dominant Israeli state-led planning policy (Shlay & Rosen 2015; Rokem & Allegra, 2016; Chiodelli 2017).

In terms of geographical layout, Jerusalem is a one-sided connected urban structure; its center develops westward, linked to its outer neighborhoods via a network of peripheral roads. Historically, the city developed along a dominant north-south alignment that follows the ancient routes to Jerusalem from Ramallah to the north and Bethlehem to the south. Jaffa Road was the main route connecting Jerusalem to the city of Jaffa at a time when the main access from abroad was by sea; it thus evolved as the vital westerly access route toward the city of Tel Aviv, Israel's main financial hub. The distribution of Jewish (purple) and Palestinian (green) majority areas, shown in Fig. 1, indicates a high degree of ethnonational-infused residential segregation between the two principal populations.

Several factors distinguish Jerusalem from other contested cities. First, it constitutes an important religious epicenter for three of the world's major monotheistic religions. Second, two nations claim it as their national capital, positioning the city at the epicenter of the Israeli–Palestinian conflict. Third, Jerusalem is not acknowledged as the official capital of Israel by the UN and most of the world's nation-states. Jerusalem is beset by several different kinds of division: historical (Israel and Palestine), ethnic and religious (Jews, Muslims, and Christians), ethnonational (Palestinians and Israelis), and linguistic (Hebrew and Arabic).

Rule over Jerusalem and the municipal boundaries of the city have shifted significantly over the last half-century. At the end of the 1948 war,⁴ the city was physically divided between two states, Jordan in the east and Israel to the west. The 1967 war⁵ between Israel and its Arab neighbors was a significant spatial turning point in Israel's geopolitical condition, with the annexation of the Golan Heights, the Gaza Strip, and the West Bank, including East Jerusalem; at this point the Israeli state declared the city its united capital (Bollens, 2000; Dumper, 2014). Despite

international opposition, the Israeli government manifests its self-proclaimed sovereignty over East and West Jerusalem via the Municipalities Ordinance, applying Israeli rule to the entire city (Lapidot, 2006).

According to the Israel Central Bureau of Statistics (ICBS 2018), at the end of 2016, the population of Jerusalem numbered 882,652. The Israeli (Jewish) population totaled 536,624 (60.8%), while the Palestinian (Muslim and Christian) population numbered 346,028 (39.2%). An important aspect of Jerusalem's demography is the clustering of its populations within homogenous neighborhoods, in terms of both ethnicity and religion. Thus, most intergroup interaction and individual violent attacks between diverging communities⁶ take place in public spaces such as markets and major public transportation infrastructures (Rokem & Vaughan, 2017).

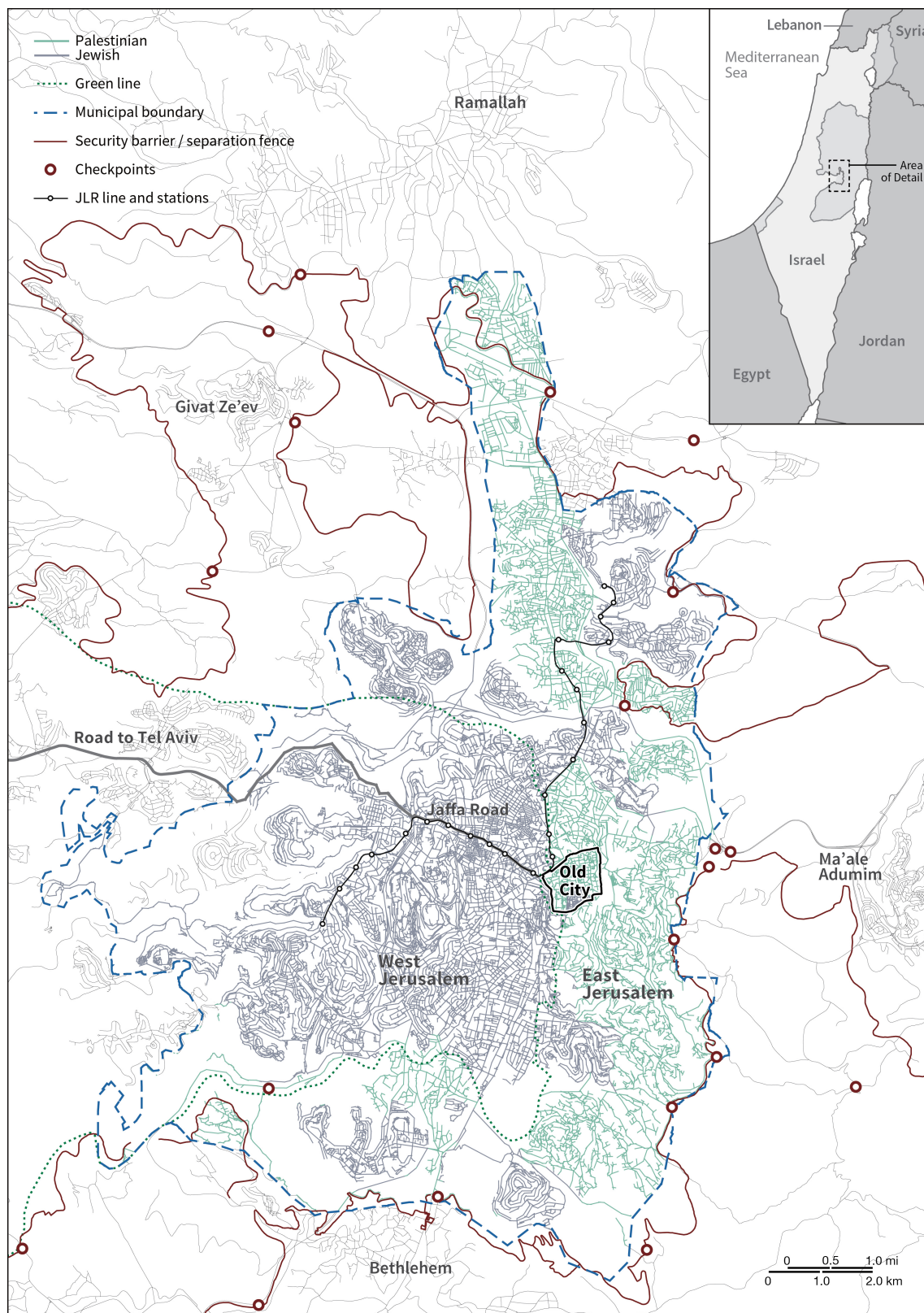


Fig. 1. Overview of political borders and boundaries (with the barrier wall and Arab and Jewish areas within the municipal boundary).

The barrier wall⁷ (see Fig. 1) is a large-scale project implemented by the Israeli state to enforce Israel's de facto political borders in Jerusalem, transforming it into the largest city in Israel, geographically. Since 2002, the barrier wall has appropriated 160 km² of the West Bank, in addition to the 70 km² of East Jerusalem annexed in the 1967 war. The wall and the attempt to create Israeli geographic continuity have damaged Jerusalem's Palestinian neighborhoods, almost completely isolating them from the West Bank hinterland (Rokem, 2016) and forcing their residents to use the city's infrastructure for most of their daily needs, such as shopping and health care. Simultaneously, preventing the access of its main clients, Palestinians from the West Bank, has resulted in a severe decline in East Jerusalem's economy.

With the exception of a small minority, Israel does not recognize the Palestinian inhabitants of East Jerusalem as Israeli citizens, granting them limited residency rights which have been further eroded over time (UNCTAD, 2013). Israel's planning policies have consistently sought to strengthen national control of East Jerusalem. Furthermore, the Israeli Ministry of Interior and the Jerusalem Municipality enforce a strict development ban forbidding almost any new construction in Palestinian neighborhoods: this has led to derelict road networks, poor education systems, and a generally chaotic urban environment (Shlomo 2017; Shtern 2018).

Due to changes in Jerusalem's geography and one-sided urban policies, Palestinian residents suffer from institutionalized inequality. Such inequalities, together with their specific local context in Jerusalem, reflect broader trends of discriminatory circumstances experienced by ethnic minority populations in contested cities. Therefore, although unique in some regards, the case of Jerusalem is highly relevant to intergroup relations in other contested urban areas.

4. DATA

In order to analyze spatial patterns of violence in Jerusalem, we obtained crowd-sourced records regarding incidents of Palestinian violence directed at Jews which took place in Jerusalem between August 2014 and December 2016. These records were chosen in light of their granular description of violent confrontations across the city. We geolocated all events mentioned in the crowd-sourced records, constructing a database of individual and collective violence which occurred in Jerusalem during recent years.⁸

We confined our analysis to violence perpetrated by Palestinians against Jewish citizens. This is mainly due to the gap between Jewish institutionalized violence, which is often implemented by government branches (e.g., police officers, border control, and military forces), and the non-institutionalized Palestinian violence, which in recent years has mainly been executed sporadically by individuals or unorganized groups. Thus, restricting our analysis to instances of Palestinian violence, which are not closely tied to state or non-state organizations, enabled us to closely examine the dynamics and patterns of individually initiated forms of violence in Jerusalem as opposed to their collective counterparts.

Our specific crowd-sourced reports contained information regarding various forms of violence, including stabbings, shootings, stone throwing, riots, ignition of improvised explosive devices (IED), ramming, and more. For the sake of precision, and in line with the definitions of collective and individual violence provided above, we analyzed and compared types of violence with a salient individualistic or collective essence, omitting ambiguous cases. As a result, hereinafter, we regard all cases of stabbings and rammings as individual forms of violence, while riots and stone throwing are considered forms of collective violence. Our data consists of

2,487 incidents, of which 117 are considered individualistic forms of violence, and 2,370 are collective forms of violence.

5. METHODS

5.1 Space Syntax

According to the theory advanced by space syntax analysis, urban spaces shape the flow of movement which provides opportunities for interpersonal exchange (Hillier & Hanson, 1984; Hillier, 1996; Hillier & Iida, 2005). Studies using these methods have found that a significant proportion of movement through urban streets is determined by the structure of the grid itself rather than specific attractors or generators of activity (Hillier, 2007, p. 125). Space syntax is particularly appropriate for the study of spatial pattern signatures unique to collective and individually perpetrated violence. Using such methods in the study of violence and conflict can offer important insights regarding intergroup confrontations in public spaces and their direct relationship with connectivity and mobility.

At its core, space syntax analysis entails developing methods to calculate the relative centrality of a spatial network. The space syntax method transforms a detailed street map into a representation comprising the network of the fewest lines that cover the entire street system. It measures the network as a configuration, computing the topological distance (how many changes of direction it takes) from one line to another within a set distance. Distance takes into account changes of direction and angle of incidence between lines.

In our study, Jerusalem's pedestrian routes are modeled as a network of street segments based on a road center-line map (data obtained from openstreetmap.org, an open, user-generated source of geospatial data). The model

was analyzed using two space syntax measures, *Choice* and *Integration*. *Choice* is a measurement of potential flow of movement through public space (streets, squares, pathways, etc.), calculated by counting the number of shortest paths connecting all road segments to all other road segments within a specified radius along the pathways. *Integration* is a measure of the proximity of one street segment to all other street segments within a specified search radius.⁹

In both cases, the space syntax model measures the directness of routes by using fewer angular changes between one street and the next. One could say that *Integration* relates to potential movement, while *Choice* is highly influenced by the scale (or distance) of measurement and will tend to highlight major roads in the network. In other words, the measures of *Choice* or *Integration* at different distances represent diverging levels of movement. For example, a combination of *Choice* and *Integration* at a small radius, such as 800 meters, tends to predict short walking journeys of around 10 minutes, while a larger radius of 2000 meters would predict movement at the city scale (Rokem and Vaughan 2017).

5.2 Grid Analysis

To explore how violence correlates with Jerusalem's spatial network, we divided the urban space into granular 0.5 x 0.5-kilometer grids (n = 531), assigning each grid a connectivity score based on the average connectivity ranks of the streets within it,¹⁰ as well as a count variable which assigns value to our dependent variables: number of individual and collective violent events that occurred therein. Additionally, each grid was assigned several indicators relating to expected confounding variables; these include dominant ethnic composition, the presence of settlements, the presence of a light rail station, and the distance from the Damascus

Gate—a major focal point for individual-level violence during recent years. With such grid-based properties, we implemented multivariate analyses to determine the relationship between a grid's connectivity score and the number of individual and collective violent events occurring within it.

6. SPATIAL ANALYSIS

6.1 Diverging Geographies of Intergroup Violence

Mapping violent events and connective segments of Jerusalem provides an informed perspective on the difference between individual and collective violence and how these are influenced by space. Fig. 2, below, shows that individual violence clusters in connective spaces, unlike collective violence which is rather scattered in the urban periphery and areas of the city adjacent to Palestinian areas. More specifically, Fig. 2 demonstrates how individual violence clusters around the top 5% of connective locations in Jerusalem (combined radius 2,000 *Integration* and *Choice* values, predicting movement at the city scale). By contrast, collective violence predominantly occurs far from these connective locations, in the more segregated, residential areas of East Jerusalem and its intersection with the Jewish Western segments of the urban space.

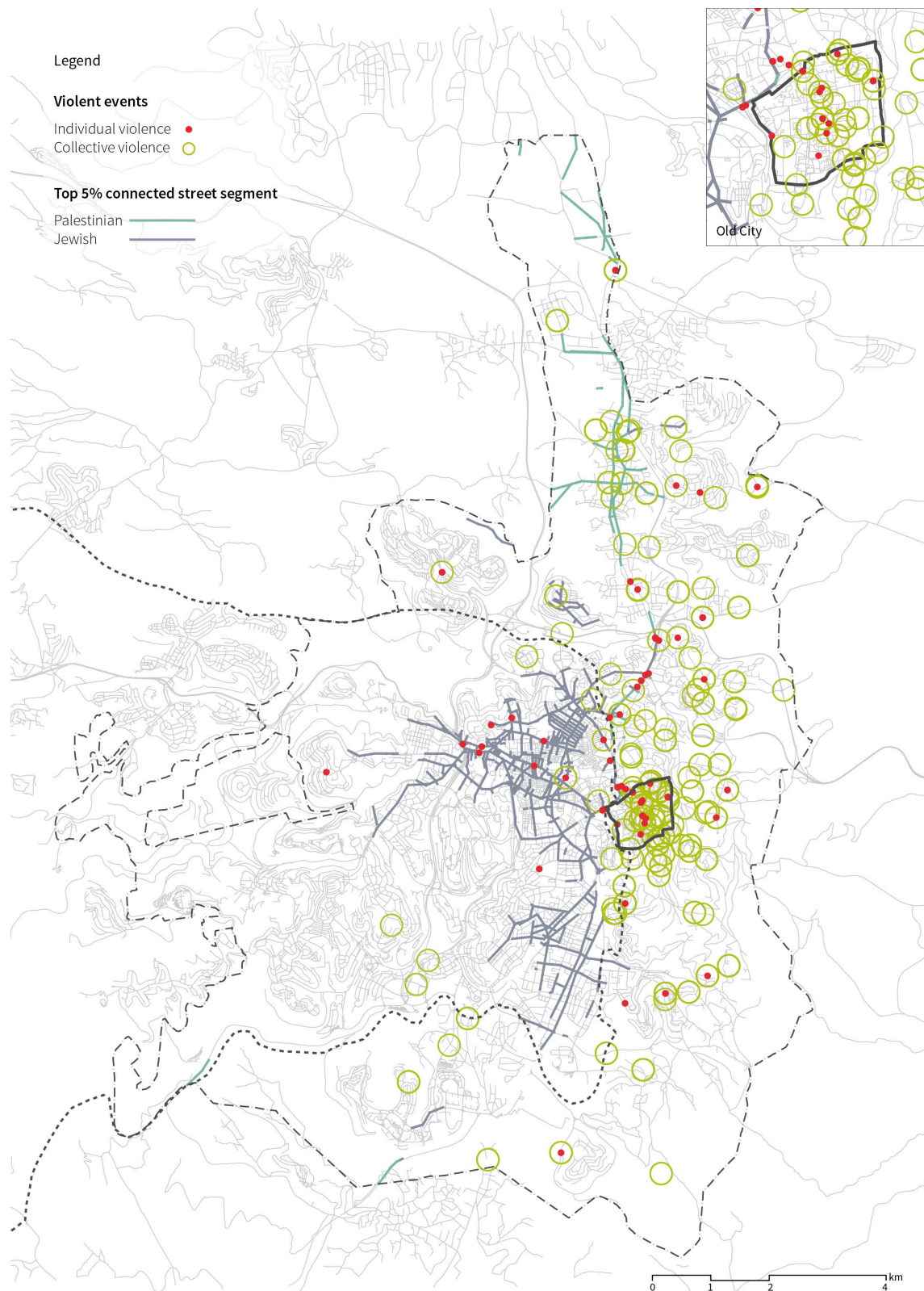


Fig. 2. Overview of individual and collective violent events and top 5% most connected streets (*Choice & Integration*).

In Fig. 2, the spatial locations of individual violence (red dots) and collective violence (green rings) reveal a clear spatial distinction between the two different event types. This indicates that while individual action converges on connective locations, collective violence in Jerusalem is much more scattered spatially, mainly across the Eastern Palestinian segments of the urban space and areas between Jewish and Palestinian neighborhoods. In addition, the Old City and its environs constitute the epicenter of both individual and collective violent events. This supports our initial hypothesis that the spatial distribution of urban collective violence differs to that of individual violence.

6.2 Statistical Model of Urban Connectivity

The space syntax analysis above (see Fig. 2) indicates a unique distinction between individual and collective violence. In order to evaluate this distinction systematically, we implemented a statistical model which helps to determine whether the diverging spatial patterns of violence mapped above result from spatial connectivity or other factors, such as the presence of a Jewish population providing accessible targets, Jerusalem Light Rail (JLR) stations facilitating intergroup contact, or embedded settlements igniting intergroup friction. As depicted in Fig. 3, the impact of grid connectivity on individual violence differs fundamentally to its effect on collective violence. Most interestingly, it is considerably more likely that the top 25% of connective grids in Jerusalem will experience individual-level violence than other locations. Concurrently, a similar trend does not appear to exist with regard to collective violence.

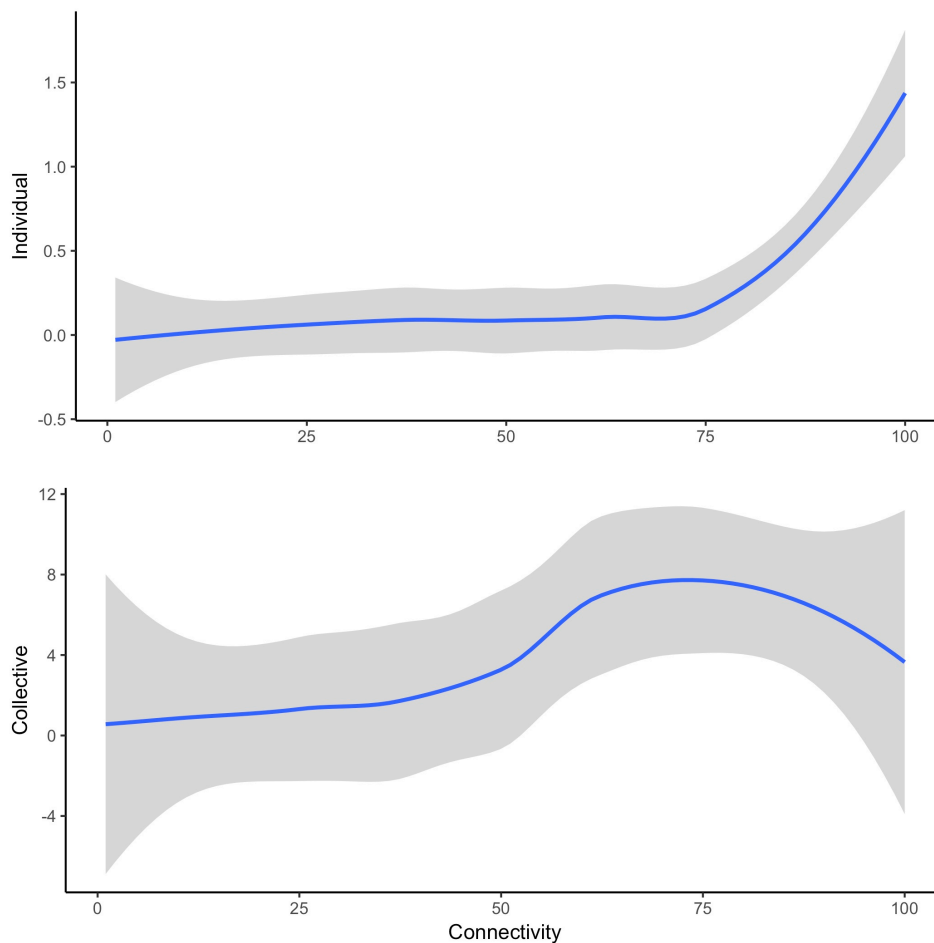


Fig. 3. Connectivity in this figure is measured by average cell values of choice + integration ($r = 800$), which are converted into percentiles ranging from 0 (the least connective segments of the city) to 100 (the most connective segments of the city).

Although Fig. 3 indicates a systematic relation between grid connectivity and individual level violence, it does not enable us to account for omitted variables which may explain the clustering of specific types of violence within connective locations. To do so, we present a multivariate analysis of within-grid violence and connectivity, controlling for multiple confounding variables.

In our statistical models, we controlled for the dominant population of each unit, differentiating between grids located in East Jerusalem (Palestinian grids) and West Jerusalem (Jewish grids). Additionally, we accounted for the presence of JLR
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stations and settlements within each grid, and measured distance from Damascus Gate for each grid.¹¹ All of our control variables are time invariant and, apart from our measure of distance from Damascus Gate, all variables are binary. A description of all our variables is presented in table 1A of the supplementary materials.

Table 1 presents the results of cross-sectional negative binomial regression models estimating the impact of three different connectivity measures on individual and collective violence, controlling for the variables described above. We chose to implement a negative binomial model in light of the discrete nature of our main independent variables—counts of individual and collective violence. Given the time invariance in our measurement of connectivity between 2014 and 2016, our ability to utilize the spatial and temporal variation of urban violence is limited. Thus, rather than implementing a panel analysis, we estimate the correlates between stable measures of grid connectivity and the sum of events occurring in that specific grid between 2014 and 2016.

Negative Binomial Regression

	<i>Dependent variable:</i>					
	Individual			Collective		
	(1)	(2)	(3)	(4)	(5)	(6)
Connectivity (800)	0.003 ^{***} (0.001)			-0.003 ^{**} (0.001)		
Connectivity (1250)		0.001 ^{***} (0.0005)			-0.002 ^{***} (0.001)	
Connectivity (2000)			0.001 ^{***} (0.0002)			-0.001 ^{***} (0.0003)
Jewish Segment	-0.810 ^{**} (0.405)	-0.863 ^{**} (0.415)	-0.921 ^{**} (0.422)	-1.422 ^{***} (0.428)	-1.477 ^{***} (0.425)	-1.527 ^{***} (0.422)
JLR Station	1.602 ^{***} (0.615)	1.376 ^{**} (0.637)	1.304 ^{**} (0.659)	-0.833 (1.075)	0.099 (1.071)	0.628 (1.070)
Damascus Gate (Distance)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0005 ^{***} (0.0001)	-0.0005 ^{***} (0.0001)	-0.001 ^{***} (0.0001)
Settlement	1.371 ^{**} (0.595)	1.527 ^{**} (0.597)	1.677 ^{***} (0.601)	1.807 [*] (0.929)	1.944 ^{**} (0.922)	1.949 ^{**} (0.914)
Constant	-2.049 ^{***} (0.651)	-2.241 ^{***} (0.675)	-2.186 ^{***} (0.704)	4.160 ^{***} (0.767)	4.308 ^{***} (0.771)	4.517 ^{***} (0.784)
Observations	496	496	496	496	496	496
Log Likelihood	-172.435	-171.842	-172.315	-497.187	-496.157	-495.005
theta	0.212 ^{***} (0.070)	0.208 ^{***} (0.067)	0.197 ^{***} (0.062)	0.054 ^{***} (0.007)	0.055 ^{***} (0.007)	0.056 ^{***} (0.007)
Akaike Inf. Crit.	356.871	355.685	356.631	1,006.373	1,004.314	1,002.009

Note: *p<0.1; **p<0.05; ***p<0.01

The models presented in Table 1 corroborate our hypotheses regarding the diverging logics of individual and collective violence. Utilizing three different measures of connectivity, and controlling for multiple alternative explanations, we show that individual violence is *positively* and significantly correlated with connectivity, whereas collective violence correlates *negatively* and significantly with connectivity.¹² Put differently, well-connected grids are more likely to experience individual violence and, at the same time, less likely to experience collective violence.¹³ Additionally, the presence of Jewish settlements within grids clearly

<https://doi.org/10.1016/j.polgeo.2018.08.008> 23

correlates positively with all forms of violence. Likewise, the presence of JLR stations is positively correlated with individual violence, whereas the distance of a grid from the Damascus Gate correlates negatively and significantly with collective violence. These results further strengthen our assertion that spatial configurations relating to connectivity and mobility have an impact on patterns of urban violence.

CONCLUSIONS

In order to understand the geographies of urban violence, it is necessary to examine a complex set of socio-spatial factors. This paper provides a more nuanced understanding of how space affects urban violence. More specifically, the findings presented herein support our two hypotheses regarding the diverging spatial logics of individual and collective violence. Thus, we show that individual violence occurs close to the central, most connected parts of a city—usually in close proximity to mobility infrastructures and central public spaces—while collective violence occurs in more segregated spaces, farther from the main arteries of public activity. Such findings demonstrate how individual and collective forms of violence in cities manifest themselves differently, and how such manifestations are driven, at least in part, by spatial factors. Whether in Jerusalem or elsewhere, analyzing urban violence without considering geographical dimensions will clearly provide incomplete understandings at best.

The theoretical approaches, methods, and findings of this paper indicate the added value of cross-disciplinary work in the analysis of urban violence. Thus, we show that the spatial logic of individually implemented intergroup violence in contested cities coincides with propositions made in the criminology literature.

Hence, criminologists may benefit from employing space syntax theories and methods, while geographers and political scientists emphasizing intergroup conflict are likely to profit from adapting theoretical conventions common in the criminological literature. Combining insights from different disciplines and methods, while paying close attention to the findings displayed throughout this paper, reinforces the call to divert attention from individual characteristics to spatial attributes when explaining the emergence of criminal behavior or violent locations.

The spatial logic of intergroup violence is especially evident in Jerusalem, wherein the potent residential segregation between ethnonational groups has contributed to inequalities not only in economic realms but also with regard to accessibility and mobility. Although Jerusalem is a unique case, we believe that matters of mobility are important in understanding the spatial patterns of inter-ethnic urban violence, and that these are likewise relevant to other cases. However, determining this requires further empirical analysis.

In line with the increasing interest in violence and its relationship to geography, we suggest that the temporal dimensions of individual violence and the relationship between spatial distance and motivation are significant matters which require further research. Additionally, our findings from Jerusalem should motivate further detailed examination of spatial patterns of intergroup violence, exploring the similarities between our chosen case and more ordinary urban environments in which conflict between diverging ethnic and religious groups over infrastructure, housing, and political participation evolve into intergroup violence.

Considering the global increase in violent events in several of the world's major cities, understanding the spatial logic of individually implemented violent attacks and how they differ from collective forms of urban violence should be of great

interest to academics and policymakers alike. Our work constitutes a first step in elucidating the geographical determinants and dynamics of the urban violence which affects the everyday lives of people in the expanding realm of cities. A critical re-examination of how we understand urban violence and how it is affected by space is becoming increasingly necessary. This will shed further light on how enhanced mobility and connectivity influence the daily lives of many residents in divided and homogenous urban environments.

Supplementary Materials

Table 1A

Descriptive Statistics					
Statistic	N	Mean	St. Dev.	Min	Max
Individual Violence	531	0.194	1.137	0	18
Collective Violence	531	3.701	22.023	0	302
Connectivity (800 M)	496	189.977	179.938	1.666	1,020.830
Connectivity (1250 M)	496	386.942	394.850	1.862	2,278.490
Connectivity (2000 M)	496	836.728	886.322	2.505	4,642.526
Jewish Segment Indicator	528	0.568	0.496	0	1
JLR Station Indicator	528	0.038	0.191	0	1
Distance from Damascus Gate Settlement Indicator	528	5,102.217	2,380.366	249.663	11,496.910

Note: In our analysis, we omit 35 grid units which do not include any roads or streets and therefore are not accorded connectivity scores. Thus, our analysis is confined to 496 grid units.

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¹ The term Palestinian, as used in this paper, indicates residents of Jerusalem who define themselves as Palestinian Jerusalemites.

² We use the term “contested” rather than “polarized” or “divided” because it captures the wider spatially, socially conflicted, and violent nature of intergroup hostilities and their manifestation at the urban scale.

³ In most cases, perpetrators were either shot and killed by security forces or civilians or were arrested.

⁴ “War of Independence” (Israeli name) or “al-Nakbah” (the disaster, Palestinian name); to simplify, here we use the common term “1948 war”.

⁵ The 1967 Six-Day War between Israel and its Arab neighbors ended with Israel's occupation of the Sinai Peninsula, West Bank, Gaza Strip, and Golan Heights.

⁶ In recent years, the number of Jews committing violent acts against Palestinians in Jerusalem has increased. It could be argued that Jewish civilian violence is motivated by the same aim—inflicting harm on the countergroup—as that perpetrated by their Palestinian rivals (although this is a less common condition, with most Israeli violence perpetrated by the police and other security forces). This phenomenon has received growing attention following a rise in violent events (2014–2015) committed by Jews targeting Palestinians, led by “Lehava,” a right-wing Jewish grassroots organization. Most of this activity occurred in the vicinity of Zion Square (a major public space adjacent to Jaffa Road in a central part of West Jerusalem) (Ir Amim, 2015).

⁷ There exists a vast array of terms reflecting different political and other narratives of the wall, including “security barrier,” “separation fence,” and “apartheid wall.” For simplicity, we use the common term “barrier wall” herein.

⁸ Data was obtained from a local Jewish crowd-sourcing project that collects fine-grained information regarding violent incidents on a daily basis. The data includes brief text descriptions of all events. This enabled us to code manually, classify, and differentiate between various forms of violence.

⁹ The spatial model itself covered Jerusalem within its Municipal Boundary, with an additional buffer of 5000 meters, excluding the areas beyond the barrier wall, for which data availability is limited (See Fig. 1). The space syntax analysis of the street network was implemented using depthmapX software. The largest search radius used here is 2000 meters, since this has been shown to provide a good overview of the city's overall structure while remaining small enough to eliminate any distortion of the results at the city edges (Hillier et al., 2012).

¹⁰ In the process of dividing Jerusalem, we obtained 35 grids without streets. These grids were omitted from all analyses because they have no connectivity values. Presented results are robust and consistent when these grids are assigned connectivity values of 0 and added to our analyses.

¹¹ Shape files for the settlement data were generously provided by “Peace Now,” an Israeli NGO.

¹² Most of our results remain consistent when estimating a Poisson regression. It should be noted, however, that, unlike most of our estimations, connectivity correlates positively with collective violence in model 4.

¹³ Although the models presented in Table 1 control for multiple alternative explanations driven by both theoretical and contextual expectations, the lack of a precise identification strategy inhibits our ability to rule out entirely the potential of omitted variable bias contaminating our results.